



Class: 2nd stage

Subject: Physical Chemistry



**Ministry of Higher Education and Scientific
Research**

Al-Mustaqbal University College

**Chemical engineering and petroleum industries
(Physical Chemistry lab)**

Experiment No.2

(Determination the Viscosity of Liquids)

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Viscosity

Viscosity is a measure of a fluid's resistance to flow. All liquids appear resistance to flow change from liquid to another, the water flows faster than glycerin, subsequently the viscosity of water is less than glycerin at same temperature. Viscosity occurs as a result of the contact of liquid layers with each other. The viscosity is measured by Ostwald viscometer. **Relative Viscosity** is the ratio of the absolute viscosity of the fluid on the viscosity of water at a certain temperature....

Viscosity equation:

$$\therefore \frac{\eta_1}{\eta_2} = \frac{t_1 d_1}{t_2 d_2}$$

η_1 is viscosity of liquid 1

η_2 is viscosity of liquid 2.

t_1 flow time of liquid 1.

t_2 flow time of liquid 2.

d_1 density of liquid 1.

d_2 density of liquid 2.



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The factors effect on the viscosity:

1. Effect of Temperature: the temperature of the liquid fluid increases its viscosity decreases. In gases its opposite, the viscosity of the gases fluids increases as the temperature of the gas increases.
2. Molecular weight: the molecular weight of the liquid increases its viscosity increases.
3. Pressure: when increase the pressure on liquids, the viscosity increase because increase the attraction force between the molecules of liquid.

Aim: measuring the viscosity of liquids

Chemicals and materials:

- 1- liquid 1
- 2- Liquid 2
- 3- Distilled water
- 4-Baker
- 5- Ostawld viscometer
- 6- Pipet



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Procedure:

1. Clean the viscometer by the water and ethanol and dry it.
2. Put a certain amount of liquid in the large bulge viscometer and pull it by pipette until the small bulge is full.
3. Put viscometer vertically in the water bath at the desired temperature.
4. Let the liquid to flow through the capillary tube with run time when the liquid reaches the mark shown on the viscometer and then stopped time when the liquid reaches the bottom mark.
5. Repeat the experiment and record the results (take average of results).
6. Repeat the experiment to other liquids.
7. Change the temperature and calculate the viscosity.



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Calculation: Calculate the viscosity by the relationships:

$$\frac{\eta_1}{\eta_2} = \frac{t_1 d_1}{t_2 d_2}$$

η_1 is viscosity of liquid 1.

η_2 is viscosity of water 0.891 poise.

t_1 flow time of liquid 1.

t_2 flow time of water.

d_1 density of liquid 1.

d_2 density of water 0.997 g/cm³ .

Can be calculate the Relative Viscosity by the relationships:

$$\eta_{\text{relative}} = \frac{\eta_1}{\eta_{\text{H}_2\text{O}}}$$

Discussion:

1. What effect on viscosity?
2. What is viscosity?
3. What are the types of viscosity?